

# Emerging Plant Pathogens and Pests

## *Prevention, Preparedness and Priorities*

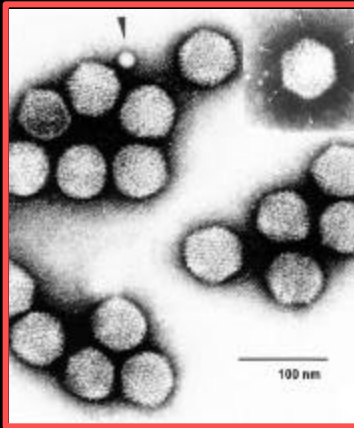


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# Plant diseases are incited by a variety of microbes...

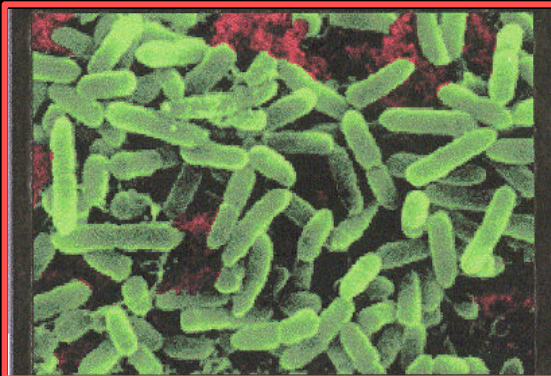
Viruses



Fungi



Bacteria



Nematodes





“If a pest can enter the United States, over time, it will find a way here.”

-D. Huber

# Crop vulnerability

- U.S. agriculture is vulnerable to emerging pathogens and pests
- About 65% of U.S. crop losses are due to introduced pathogens, costing \$137 billion/year
- What is needed to assure the security of crops and natural resources?
  - Research
  - Infrastructure



# Crop vulnerability, continued



Plum pox virus

- Crops, forests and rangeland cover 1 billion acres; to see something new at its early stages is “like spotting a needle in a haystack”
- Long periods between pathogen introduction, detection and identification, and response

# Introduced species

- Some insects and pathogens are introduced intentionally, others unintentionally
- 550 of the 2000 known, potentially damaging 'exotic' plant pathogens pose significant new risks to U.S. agriculture



# Case #1. Citrus canker in Florida: It's not just a question of juice



Citrus canker

Citrus is an \$8.5 billion industry in Florida

Threat: Serious epidemic of citrus canker

Problem: Diagnostics must differentiate canker vs. non-canker bacteria

# Citrus canker: monitoring movement and rate of spread

## Disease spread:

1995: Discovered near Miami airport

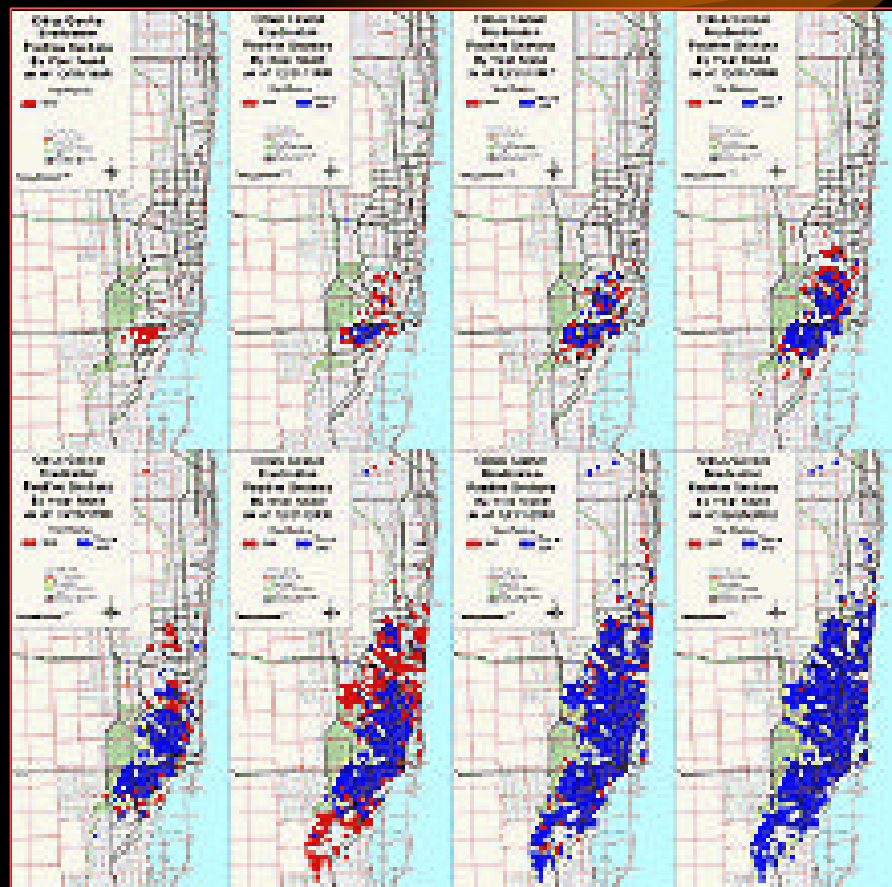
Likely from an accidental introduction on illegal citrus cuttings in 1993

Now affects > 1000 mi<sup>2</sup> of urban area and orchards

## Cooperative management program:

FL. Dept. of Agriculture & Consumer Services

USDA-APHIS



Gottwald et al. 2002.

# Citrus canker management: eradication of diseased trees *and* trees within a certain radius



Gottwald et al. 2002.

Goal: eradication

Successful in the past and considered possible again

Growers are in favor, but homeowners are resisting.

# Citrus canker: eradication facts and issues



- Cost: so far, over \$200 million to destroy 10 million trees
- Disease is still spreading

# Case #2. Pierce's disease of grapes: California vineyards brace for sharpshooter



Grapevine symptoms



Glassy-winged sharpshooter

Threat: To California's \$2.8 billion wine, table and raisin grape industry

-Over 700,000 vineyard acres at risk

History:

-Bacterial disease in California since 1880s

-Vector: small, weak blue-green sharpshooter

-Current epidemic: new, aggressive, introduced vector, the glassy-winged sharpshooter

# Pierce's disease management: a coordinated, well-funded, multi-faceted approach

## The team:

State, federal, academic, private and commodity groups - coordinated

## The strategies - targets:

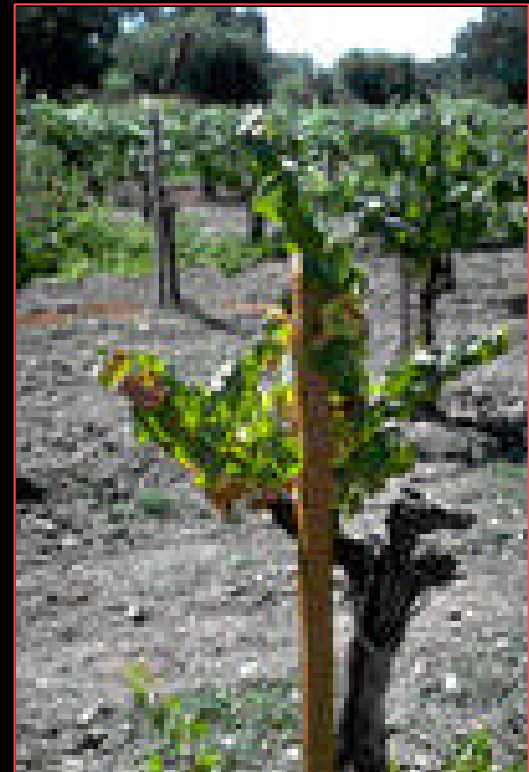
Insect vector

Bacterial pathogen

Plant host

## The funding:

17 different agencies



Cane symptoms

# Case #3. Soybean rust: are we ready for it?

Rust symptoms on leaf



Photos: G.L. Hartman

U.S. production area: 75 billion acres

Crop value: \$13 billion

## History of rust disease:

- Long history in Asia
- Yield losses 10-30% common (U.S. equivalent = \$4 billion), and >90% occasional
- Spread Asia - Africa - Brazil within last decade

## Threat to the U.S.:

"It's not a question of *if* but of *when*."

# Can we pre-empt soybean rust with a national plan?

The plan must include:

## 1. Early detection

National surveillance

Rapid diagnostics

## 2. Rapid response

Advisories

Control/management

Spores of the rust fungus



# What is needed to protect U.S. crops against plant pathogen and pest invaders?



1. Find better ways to prevent pathogen/pest introduction and movement
2. Support new research initiatives in:
  - Detection, diagnostics, and forensics
  - Pathogen/pest biology and epidemiology
  - Disease prevention and control
3. Make infrastructural changes to enhance capabilities

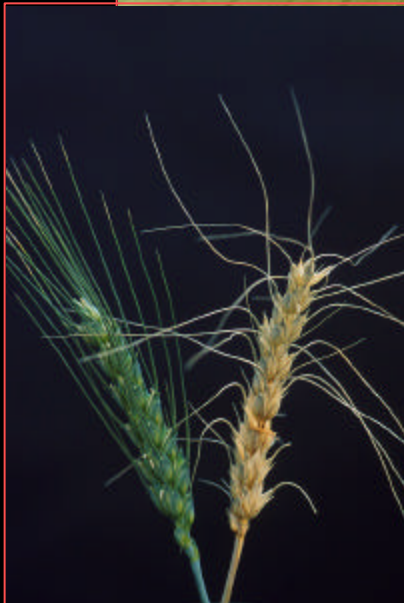
# Research needs



1. Sequences of most threatening plant pathogens for:
  - Detection - rapid, reliable; use novel sequences
  - Forensics – trace origin and timing of initial infection
  - Identification – identify pathogen, differentiate isolates

*We need new tools that are easy and fast!*

# Research needs



## 2. Risk-assessment

more-effective procedures  
more trained personnel  
more international cooperation

## 3. Disease management

new control measures

# Infrastructure needs

- Network of plant disease and pest diagnostic laboratories
- Central coordinating body (“CDC-like” center)
- Coordinated network of professional societies, private industry, grower groups, state and national government entities



# The bottom line

U.S. crops, forests and rangelands are vulnerable to introduced pathogens and pests - intentional or not.

Investments in research and infrastructure are critically needed to protect these resources and respond rapidly and appropriately to the threat of introduced agents.

